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LAKS

Fifth Quarterly Report

Contract NASr-1146

Project 15G-B2029-01

Period: 1 November 1963 to 31 January 1964

Attention: Dr. T. L. K. Small
Contracting Officer**UNPUBLISHED PRELIMINARY DATA**

During the referenced period effort was prosecuted in the following specific areas:

1. Roach Actograph

Twenty units of our latest design were installed at Princeton by us during the month of December. In the process of installation over three thousand feet of cable were run.

These latest units are virtually unchanged electrically from earlier designs, but incorporate important physical differences. The roach area has been designed in a "pull-out-drawer" form for easy access, cleaning, etc.; inlet fittings and an air distribution system have been incorporated so that the researcher can control ventilation rate and air temperature; a light pipe with incorporable neutral-density filter fittings has been built in to allow external control of the interior lighting; the interior arrangements have been modified to put food and water detection area in a single location and to incorporate a separate "isolation" detection area which is one of low light. Lastly, provision has been made for incorporation of thermocouples to monitor internal air temperature.

2. Data Distribution System (Part A)

A two-console data distribution system has been designed and built by us and will be installed at Princeton during the second week in February.

It is the function of this system to allow the separate distribution of data from 18 roach actographs (54 data sources) to any of 54 recording pens. Simultaneously and with no interference, any one, or combination of the 54 sources, can be distributed to the Mark I automatic data processor. The researcher is thus given a wide choice of recording media and can use the pen-recorders and IBM card for double data-coverage ("backup") and/or for increasing the scope of data recorded at any given time.

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About 25 units are now under construction. When they are finished, twenty will be reserved for Princeton, two will be given to Ames (as per the 28 January 1964 (telecon) request of Mr. George Cook) and three will be used in a new test-to-failure here.

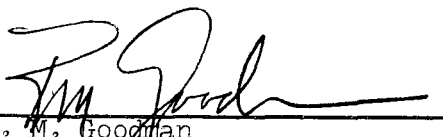
Some small initial effort has been initiated on a 0.5 cc active temperature telemeter.

It is our hope to be able to replace batteries in both the Mark IV units and the new smaller unit. This should result in dollar savings for the researcher even if successful with as few as 40% of the units.

6. Miscellaneous

During November 1963 we were visited by Mr. George Cook and Dr. John Tremor of Ames. We discussed our instrumentation techniques in detail and a variety of problems associated with the telemeters (at that time).

Mr. Cook was given extensive photographic and schematic data on the actographs and on telemeter material.


R. M. Goodman
Principal Investigator

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The entire automatic operation is controlled by a real-time digital clock which controls locomotory data integration periods, "allows" the initiation of read-out cycles, provides special safety interlocks, feeds real-time data to each punched card, controls automatic operation of the telemetry console, etc.

Insofar as practicable at this time, a reasonable degree of flexibility has been designed into the system. For example, each encoding-recording period may consist of one, two or three IBM cards. Provisions to allow expansion of locomotory activity data integrator consoles have been considered. Temperature-telemetry data will be sampled and accumulated automatically with both visual and punch-out data resulting. Manual control of telemetry data is provided with automatic override of manual mode operation by the automatic system. This latter provision precludes the possibility of inadvertent loss of automatically sampled data (controlled by the "clock") because the researcher is taking manual-mode data at that instant. This arrangement simply means that the manual-mode will be subject to automatic override at certain clock periods and allows the researcher to avoid the hypertension likely to ensue if he obviated a card-full of data by unfortunately timed manual observation.

Once the experimental conditions have been set by the researcher the Mark I is completely automatic. It requires only IBM cards for continuous operation. All IBM cards are sequentially encoded and will contain data such as experiment identification, real time, experimental conditions, locomotory data integrals, digital temperature data, etc.

The Mark I has a variety of malfunction alarm circuits and in certain cases can emit audible, in addition to visual, indications.

Unless unforeseen difficulties arise, the system installation should begin at Princeton in April, 1964.

5. FIL Mark IV Telemeters

In the period a large variety of sealing materials were studied and the problem appears to be solved. A two-step process has been worked out to provide good telemeter seals. To date, more than 1300 hours of submersion in a water bath (35° to $40^{\circ}\text{C}.$) with a 6" head has produced no leakage.

In our measurements to date, water bath temperatures have been controlled to about $\pm .05^{\circ}\text{C}.$ However, we hope that our next run will allow control to $\pm .01^{\circ}\text{C}.$

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Incorporated as part of this system is a patchboard arrangement through which the researcher can distribute data recording to recorders and IBM card positions of his choice.

The consoles also include a set of six 24-hour timers which control six experimental stimuli. These stimuli can be set into the 18 actographs in any combination or permutation.

Power for the stimulus is applied by two regulated power supplies which are separately controllable. It is thus possible to control the occurrence of stimuli and the intensity independently.

In general the distribution system consists of a major patchboard allowing the distribution of each of 54 data sources to any of 54 event recorders, a second major patchboard allowing the linkage of any combination of six stimulus sources to any of 18 roach actographs, the distribution of any of 54 data sources to the Mark I automatic data processor up to the limit of its capacity, variable voltage regulated power supplies, distribution relays and special self-powered alarm circuits with both visual and audible alarm outputs. The alarm circuits "lock in" under a variety of malfunction circumstances and cannot be "unlocked" until the difficulty has been corrected.

3. Data Distribution System (Part B)

Later in our program we will install a distribution console to handle hamster activity data in a manner similar to that utilized in Part A.

4. The FII Mark I Data Processor

This unit, now under construction, will consist of four consoles. Its several hundred relays, transistors, diodes and networks will accept data from locomotory activity detectors and temperature telemeters automatically and/or manually. It will arrange these data adequately and control an IBM card punch so that data recording will be processed.

The system consists of a master control (M-unit) with associated consoles and a telemeter console (T-unit) which operates through the M-unit. Considerable design effort has been prosecuted to preclude system malfunction wherein much data are lost because of isolated difficulties. This has led to the introduction of interlocking circuitry and switching and override control-function. Also incorporated are overall interlocking circuitry which ties together all critical consoles.

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